MetroWest Bicycle-Pedestrian Study

A report produced by the Central Transportation Planning Staff for the Massachusetts Highway Department

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Cover photographs, clockwise from upper left: (1) potential Riverside Connector, (2) Route 126, Framingham Center, (3) West Natick MBTA Commuter Rail Station, (4) Route 135, Wellesley Square. Photographs by C. Lewis.

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Executive Summary

This study provides information on the bicycling and pedestrian modes for the MetroWest area. The MetroWest area includes Ashland, Framingham, Marlborough, Natick, Southborough, Sudbury, Wayland, Wellesley, and Weston. For this report, the towns of Dover, Hudson, Needham and Sherborn are included.

Information is provided on population and employment in the area. Data on the transportation modes used to get to work are presented, with a detailed discussion of the bicycle and pedestrian mode shares. Included are data on what modes people used to reach commuter rail stations.

Bicycle and pedestrian accident data are presented, including maps of these accidents at the community level, for the years 1989-1991 inclusive. Enclosed in the back flap is a copy of the MetroWest Bike Map, a major product of this study. The map presents an initial rating of the suitability of major arterials and primary roads within the study area for use by bicyclists.

Information is presented on possible future efforts, including trail developments on abandoned rail rights-of-way and aqueducts. Of the recommendations made by this study, the most important is that the MetroWest Bicycle-Pedestrian Steering Committee continue to provide a regional focus on these modes of travel and help foster local committees that can address these issues at the municipal level.

These local committees can spearhead efforts both to promote the construction of regional trail facilities and to focus attention on roads within their borders. It is this system of roads that provides access within and through their communities for all modes of transportation, including walkers and bicyclists. Opportunities to improve these local roads come up through routine maintenance and periodic reconstructions. The recently passed Paulsen Bill requires that consideration for bicyclists and pedestrians be included in all highway projects whenever feasible.

Introduction

This study came about as part of the Boston region's response to a federal directive to prepare bicycle-pedestrian plans for metropolitan areas. This mandate, included in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, requires transportation plans for all metropolitan areas, and bicycle-pedestrian components of those plans. The Transportation Plan of the Boston Metropolitan Planning Organization (MPO) includes the bicycle and pedestrian modes. This study, which is a subregional response to that mandate, was done in the MetroWest region because of strong interest on the part of the MetroWest Growth Management Committee in studying bicycle and pedestrian opportunities in the area.

MetroWest is a subregion of the Metropolitan Area Planning Council (MAPC), the regional planning agency in metropolitan Boston. The MetroWest communities are Ashland, Framingham, Marlborough, Natick, Southborough, Sudbury, Wayland, Wellesley, and Weston. The towns of Dover, Hudson, Needham, and Sherborn were added to this study at their request. For the purpose of this report "MetroWest" will refer to the study area, which includes the actual "MetroWest" plus the four communities that were added.

A bicycle-pedestrian steering committee was formed by the MetroWest Growth Management Committee, comprising one or more members from each community. This committee met throughout the course of the study and provided guidance at the subregional and local levels. The committee members are listed below:

Chair:	John Stasik, Framingham
Ashland:	Cliff Wilson, Dennis Wilson
Dover:	Menno Koning
Framingham:	Ed Kross, Bill McDonough
Hudson:	Jeff Richards
Marlborough:	Phil Hodge
Natick:	Howard Wolk, Karl Schlemmer
Sherborn:	Betty Dowse
Southborough:	the late Roger Baust
Sudbury:	Dan Buttner
Wayland:	Ed Wallner
Wellesley:	Dick Parkinson, Dan Gordon
Weston:	Ken Hablow

Significant input was received from John Allen of the Bicycle Coalition of Massachusetts. A list of the committee meetings held during the course of this study is included in Appendix A.

Bicycling and walking modes are often associated together in people's minds, probably because these modes are both non motorized. In terms of operational issues, they are very different. Pedestrians and bicyclists have very different operating speeds and ranges of travel. The bicycle is a legal vehicle, subject to almost all of the motor-vehicle laws, and shares most roads with motor vehicles.

Some aspects of this study are primarily concerned with the bicycling mode, some with the pedestrian mode, some equally with both. Any trails that are developed will be multi-use trails, available to bicyclists, walkers, skaters, babies in carriages, people in wheelchairs, and all other non motorized users. The map prepared as part of this study is primarily for bicyclists. Specific barriers discussed in the report often have more of an impact on pedestrians than on bicyclists.

1 Existing Conditions

The MetroWest area is located west of Boston, between Interstate Routes 95 (Route 128) and 495 (see Figure 1). This chapter provides some background on the study area in terms of population and employment, travel modes used to get to and from work, and bicycle and pedestrian accident data.

A. Population and Employment

The study area is primarily residential. Communities with relatively large employment bases as well as significant commercial development are Framingham, Marlborough, and Natick. Table 1 indicates population by community. As can be seen, there is a significant range, from less than 4,000 in Sherborn to 16 times that number in Framingham.

Table 1
Population by Community

	1990 Population	Under 6 Yrs.	6-16 Yrs.	% under 17
Ashland	12,066	940	1,717	22.0
Dover	4,915	414	792	24.5
Framingham	64,972	4,145	8,507	19.5
Hudson	17,233	1,220	2,748	23.0
Marlborough	31,813	2,459	4,442	21.7
Natick	30,534	1,966	4,103	19.9
Needham	27,557	2,231	4,031	22.7
Sherborn	3,989	320	709	25.8
Southborough	6,628	495	1,185	25.4
Sudbury	14,358	1,041	2,819	26.9
Wayland	11,867	807	2,056	24.1
Wellesley	26,615	1,565	3,834	20.3
Weston	9,332	536	1,565	20.6
MetroWest	**261,879**	**18,139**	**38,508**	**21.6**

Source: 1990 U.S. Census Data

FIGURE 1
Study Area

Those under 17 years of age are highlighted because they cannot lawfully drive motor vehicles and are more apt to bicycle and walk. This group makes up about one-fifth to one-quarter of the population in each community. Those under six are also indicated. These individuals will not as a rule be making trips on their own. The oldest amongst them will be riding bicycles, with or without training wheels, and beginning to venture out onto neighborhood sidewalks and quiet streets.

One of the challenges in bicycle and pedestrian planning is that users are of all ages and levels of competence. Motor-vehicle drivers, on the other hand, must be of a minimum age and licensed to drive. There are no age or competency requirements for bicycling or, of course, for walking. This issue comes up in regard to facility planning. There are experienced, adept adult bicyclists who bicycle on major arterials. There are bicyclists who are comfortable on low-traffic roads, but not on busy thoroughfares. And there are those, of all ages, who avoid motor-vehicle traffic altogether. The Federal Highway Administration (FHWA) has classified these three groups as A, B, and C bicyclists, respectively.

B. Modes Used for Work Trips

Table 2 indicates the primary mode of travel used by residents to get to work. There are some limitations to these data for the bicycling and walking modes. They are estimates based on a sample questionnaire that is sent only to workers over 16 years of age. All students, including those over 16, are excluded. Trips by residents attending colleges within MetroWest (such as Babson, Wellesley College, or Framingham State) or outside the study area are not reflected in these data. Only work trips are included, a category of travel that is increasingly becoming a smaller piece of the travel pie. Also, these census data are collected in early spring, when, according to metropolitan Boston counts, bicycle volumes are about one-quarter of the peak-season volumes. Finally, the census questionnaire asks which mode was used for the longest part of the trip to work. A trip involving a two-mile bicycle ride to a train station, a three-mile train ride, and a one-half-mile walk to the office would be classified as a railroad trip.

The auto mode includes both those who drive alone and those who carpool. Public transport includes commuter rail, private buses, and those who drive to Riverside (or other points outside the study area) and use rapid transit or buses. Of the 142,077 resident workers in the study area, 125,397, or over 88 percent, use an automobile to get to work. Only 6,321, or just over 4 percent, use public transportation. Communities with the highest number of resident workers using public transportation are Needham, Natick, Wellesley, and Framingham, all of which are served directly by commuter rail. (In terms of the *percentage* of resident workers who use public transportation, however, the share in Framingham is relatively low, as Framingham has more than twice the population of any other community in the study area.)

Table 2
Number of Residents Commuting to Work, by Mode, by Community

Community	All Workers	Auto	Public Transport	Bicycle	Walk	Other	Avg. Time To Work (min.)
Ashland	7,058	6,465	225	23	88	257	27.0
Dover	2,411	2,023	201	11	16	160	29.8
Framingham	36,071	32,766	1,042	108	1,230	925	23.9
Hudson	9,602	9,113	61	18	191	219	23.1
Marlborough	17,754	16,884	122	25	369	354	22.3
Natick	17,476	15,259	1,245	28	456	488	25.3
Needham	13,917	11,525	1,405	13	333	641	24.0
Sherborn	2,040	1,808	101	6	50	75	28.9
Southborough	3,563	3,219	35	15	152	142	23.3
Sudbury	7,813	7,137	165	6	134	371	27.2
Wayland	6,282	5,604	226	16	80	356	25.3
Wellesley	13,041	9,608	1,162	55	1,489	727	23.4
Weston	5,049	3,986	331	0	236	496	23.8
MetroWest	**142,077**	**125,397**	**6,321**	**324**	**4,824**	**5,211**	**25.2**

Source: 1990 U.S. Journey-to-Work Data

Table 2 also indicates the average time it takes to get to work. The range is from a high of 29.8 minutes in Dover to a low of 22.3 in Marlborough. Factors that affect this variable are the average distance to work, the amount of traffic congestion, and the number of people using public transportation. In regard to the latter, those using commuter rail, for example, need to get to the station, wait for a train, and reach their job, usually by foot or transit, at the other end. The total time of the trip is usually greater than if they drove and were able to park near their job. On the other hand, a good portion of their trip is available for reading or resting, which is not available to those who are driving.

Table 3 highlights the percentage of residents who bicycle or walk to work. As can be seen, the bicycle mode share is low, less than 10 percent of the walk mode, which in turn is less than 4 percent of the auto mode. Dover, Wellesley, and Southborough have the highest percentages of biking (almost 0.5 percent), which in peak season might be about 2 percent.

Table 3
Percentage of Residents
Bicycling and Walking to Work,
By Community

Community	All Workers	Bicycle	% Bicycle	Walk	% Walk
Ashland	7,058	23	0.33	88	1.25
Dover	2,411	11	0.46	16	0.66
Framingham	36,071	108	0.30	1,230	3.41
Hudson	9,602	18	0.19	191	1.99
Marlborough	17,754	25	0.14	369	2.08
Natick	17,476	28	0.16	456	2.61
Needham	13,917	13	0.09	333	2.39
Sherborn	2,040	6	0.29	50	2.45
Southborough	3,563	15	0.42	152	4.27
Sudbury	7,813	6	0.08	134	1.72
Wayland	6,282	16	0.25	80	1.27
Wellesley	13,041	55	0.42	1,489	11.42
Weston	5,049	0	0.00	236	4.67
MetroWest	**142,077**	**324**	**0.23**	**4,824**	**3.40**

Source: 1990 U.S. Census Journey-to-Work Data

Over 3 percent of the total working residents of the study area walk to work. In some communities (Framingham, Hudson, Marlborough, Southborough and Wellesley), it is higher than the public transportation share. Wellesley has the highest percentage of people walking to work at 11.4 percent, much higher than the study area average of 3.4 percent or of the next highest community (Weston at 4.7 percent). The statewide averages are 5.4 percent for walking and 0.4 percent for bicycling.

One of the reasons people do not bicycle to work is that they fear sharing the street system with motor vehicles. It is expected that if trails are built, then there would not only be commuters using them to reach their workplaces or transit connections, but others who, by using trails, would become more experienced bicyclists and more apt to venture onto the streets. It is also likely that many people do not consider bicycling to and from work because it is not a mode that is strongly encouraged. With separate facilities and on-street improvements, there is great potential for this mode, given its convenience.

Details on mode of access to commuter rail stations in the study area are presented in Chapter 4, Intermodal Connections (see Table 5).

C. Accident Data

The Massachusetts Registry of Motor Vehicles (RMV) collects data on motor-vehicle accidents, including those involving bicyclists and pedestrians. The Massachusetts Highway Department (MHD) maintains these records and has data from 1989 through 1991 (inclusive) available. Table 4 indicates the number of motor–vehicle accidents involving bicyclists and pedestrians by community for those three years, as well as the rate of these accidents per thousand residents.

Table 4
Pedestrian and Bicycle Accidents
and Rates per Thousand Residents,
1989-1991

Community	1990 Population	Pedestrian		Bicycle	
		# Accidents	# Accidents per Thousand Residents	# Accidents	# Accidents per Thousand Residents
Ashland	12,066	17	1.41	3	0.24
Dover	4,915	0	0.00	2	0.41
Framingham	64,972	137	2.11	105	1.62
Hudson	17,233	24	1.39	22	1.28
Marlborough	31,813	48	1.51	18	0.57
Natick	30,534	41	1.34	15	0.49
Needham	27,557	31	1.12	22	0.80
Sherborn	3,989	0	0.00	0	0.00
Southborough	6,628	6	0.91	4	0.60
Sudbury	14,358	7	0.49	13	0.91
Wayland	11,867	8	0.67	17	1.43
Wellesley	26,615	48	1.80	44	1.65
Weston	9,332	15	1.61	12	1.29
MetroWest	**261,879**	**382**	**1.46**	**277**	**1.06**
Massachusetts	**6,016,425**	**10,632**	**1.77**	**5,761**	**0.96**

Source: Population--1990 U.S. Census; accident data--Mass. RMV via MHD

These data are limited. First, for many of the reported accidents, there is incomplete information, especially regarding location. Second, many accidents go unreported, especially bicycle accidents that involve falls but do not involve impact with a motor vehicle.

Of the 382 pedestrian accidents in MetroWest during this three-year period, five involved pedestrian fatalities: two in Hudson and one each in Framingham, Natick, and Wellesley. Of the 277 bicycle accidents, the single bicyclist fatality occurred in Marlborough.

As can be seen, there are significant differences in accident rates among the communities. The highest rates for both bicycle and pedestrian accidents occur in Framingham and Wellesley. The largest numbers of accidents occur in these two towns as well. At the other end of the scale, there were no bicycle or pedestrian accidents reported in Sherborn for this three-year period.

By Community

Maps of both pedestrian and bicycle accidents by community are included in Appendix B. Taking the communities alphabetically: In Ashland there were no fatalities during these three years. The 3 bicycle accidents that did occur there gave Ashland the second lowest rate in the study area, following Sherborn. The 17 pedestrian accidents were, on a population basis, average for the area. In Dover, there were no pedestrian accidents and 2 bicycle accidents, resulting in the third lowest rate of bicycle accidents.

In Framingham there were 137 pedestrian accidents, including a fatality, and 105 bicycle accidents. Framingham had the highest rate for pedestrian accidents and the second highest rate, just behind Wellesley, for bicycle accidents. There was a large concentration of accidents along the Route 126 corridor, especially between just north of Route 30 and just south of Route 135. This area includes Framingham Center. There were also many accidents along Route 135 from the Natick line to west of Farm Pond. Many occurred along Route 9. Almost all of the accidents were south of Route 30, where most of the development and population of Framingham are found.

Hudson had 24 pedestrian accidents, including 2 fatalities, and 22 bicycle accidents. The pedestrian rate of accidents was about average for MetroWest; the bicycle rate was above average. Almost all the accidents occurred in western Hudson. There was a cluster on Tower Street and a fair number occurred in or near Hudson Center. The 2 fatalities occurred in residential areas.

Marlborough had 48 pedestrian accidents and 18 bicycle accidents, including 1 fatality. Its rates were slightly higher than the MetroWest average for pedestrian accidents and significantly lower than average for bicycle accidents. The highest accident concentration was along Route 20, especially between Williams Street and Concord Road.

Natick had 41 pedestrian accidents, at a rate per resident that was slightly above average for MetroWest. There were 15 bicycle accidents in the same three-year period,

which yielded a lower-than-average rate. The largest concentration was in the vicinity of Natick Center, where Routes 27 and 135 intersect. There was 1 pedestrian fatality, somewhere on Route 9 (no cross street or other reference was given).

Needham had 31 pedestrian accidents and 22 bicycle accidents, with no fatalities in this 1989-1991 period. The rate for both categories was below average. A very clear clustering of accidents occurred in the Needham Center area, along Route 135 (Great Plain Avenue). There were also many accidents along Highland Avenue.

Southborough had 6 pedestrian and 4 bicycle accidents, below the MetroWest average rates in both categories. There was no geographic clustering of these accidents.

Sudbury had 7 pedestrian and 13 bicycle accidents. The rate of pedestrian accidents was the third lowest in the study area. The rate of bicycle accidents was below the MetroWest average and sixth highest of the thirteen communities overall. There were no fatalities during this period. About half of these accidents occurred on Route 20, between Raymond Road and the Marlborough line.

Wayland had 8 pedestrian and 17 bicycle accidents. This is a relatively low rate for pedestrian accidents, and the third highest rate in the area for bicycle accidents. The primary concentration of accidents occurred at or near the intersection of Routes 27 and 30. There were also several pedestrian accidents along Route 126, near the Framingham line.

Wellesley had the second highest rate of pedestrian accidents, with 48 accidents at a rate of 1.80 per thousand residents. There were 44 bicycle accidents, resulting in the highest rate in the MetroWest area at 1.65 bicycle accidents per thousand residents. The overwhelming majority of these accidents (bicycle and pedestrian) occurred along the Route 16 (Washington Street) corridor, from the Newton line to the vicinity of Wellesley College. There were also many in Wellesley Center, along Route 135, and a handful along Route 9, including a pedestrian fatality. There were no bicycle fatalities during this 1989-1991 period.

Weston had 15 pedestrian and 12 bicycle accidents, resulting in fairly high rates as compared to the other MetroWest communities (third and fourth highest respectively).

Only Sudbury, Dover, and Wayland had more bicycle than pedestrian accidents. Hudson and Wellesley had about equal numbers in each category. The remaining communities had more pedestrian than bicycle accidents. Overall, there were almost 40 percent more pedestrian than bicycle accidents in the study area.

As shown in Table 4, the pedestrian accident rate in the MetroWest area is lower than the statewide average (1.46 versus 1.77 per thousand residents). The rate of bicycle

accidents is slightly higher in the MetroWest area (1.06 versus 0.96 statewide).

There is not enough information to determine why certain communities have higher rates of accidents than others or why certain locations have more accidents than others. Possible explanations are higher levels of motor-vehicle traffic and higher levels of walking and bicycling. "Exposure rates," rates that take these volumes into account and indicate the number of accidents per given level of traffic, are not determined in this study. If available, they would highlight areas that have particularly high numbers of accidents due to factors other than simply high levels of traffic. These other factors include, but are not limited to, excessive speed, disregard of traffic signals, lack of space for pedestrians and bicyclists, and poor sight distance. Some of these factors pertain to motor-vehicle operators, some to bicyclists and pedestrians, and some to the roadway system.

In some cases, no accident concentrations are found. In other cases, specific intersections or roads are the location of many accidents. Again, the location of accidents may be a reflection of volumes of pedestrian and bicycle traffic as well as of hazardous conditions. That is, the accidents may be occurring where the most activity is occurring. An intersection with a large number of accidents may be as safe from a traffic design point of view as another with no accidents. One intersection might attract many bicycle and pedestrian trips, the other may attract few.

High accident locations ought to be studied to find out whether there are design, operational, or enforcement issues that need to be addressed. Additional measures need to be taken to reduce these accident rates and it is important to determine what type of measures–new signing, police enforcement, traffic control, design changes–would be most effective. Likewise, a lack of accidents at a location is not necessarily a measure of safety. It may be a dangerous intersection that is avoided by bicyclists and pedestrians. It is most appropriate for these types of safety analyses to be performed or overseen by a local bicycle and pedestrian committee and local staff.

2 On-Road Alternatives

When this study began, it appeared that off-road alternatives would receive most of the attention. Through committee discussions, it became clear that there was interest in both on- and off-road alternatives. Off-road alternatives are very attractive in terms of separation from motor vehicles and the special conditions they offer. Yet only on-road alternatives can provide the comprehensive system required for bicyclists and pedestrians to reach all destinations.

The on-road research emphasized bicycling needs, as the committee was composed primarily of bicyclists. Bicyclists have the same rights and responsibilities as motor-vehicle operators, per Massachusetts General Law. Bicyclists are entitled to use all roads except those that are posted for no bicycling. In the MetroWest area, the prohibited roads are the Massachusetts Turnpike and Interstate Routes 95 and 495. Pedestrians also are legally prohibited from these roads.

This study's on-road research focused on developing a map that provides information on the relative suitability of roads for bicycling. In this case the roads are classified into three categories: (1) the most suitable, (2) those recommended for only experienced bicyclists, and (3) the least suitable. Only major arterials and feeder roads are included; no minor residential streets are rated. In general, these minor streets are very acceptable for bicycling, having little, and relatively slow-moving, traffic. They would be used by residents only or occasionally by through cyclists to avoid specific areas.

A. Road Design: Problems and Solutions

Bicyclists and Roadway Width

The most common road constraint for bicyclists is lack of operating space. Room for bicyclists can be provided by paved shoulders or by wide outside travel lanes. According to the American Association of State Highway and Transportation Officials (AASHTO), bicycles and motor vehicles are compatible with an outside-lane width of 14 feet. This width is not common in the metropolitan Boston area. Route 16 in Wellesley has sections (leading into the Square from the south, for example) where these widths are available. The goal is to provide this outside-lane width whenever possible. However, a lane width of 12 feet is certainly better than 10. Interestingly, more is better only up to a point. Lane widths greater than 14 feet can lead to situations where motor vehicles begin to create another traffic lane, thereby slowing down or

blocking bicycle movement.[1]

Increases in outside-lane widths can be implemented in the course of ongoing reconstruction and re-striping, as well as through special projects. When widening is not possible, extra width often can be taken from other lanes. For example, a 48-foot-wide, four-lane, two-way arterial, instead of being striped for four 12-foot lanes, could be restriped as 11 on the inside lanes and 13 on the outside lanes.

Travel lanes can be removed in some cases with minimal effect on the level of service of motor vehicles. For example, a 40-foot-wide, four-lane road could become a two-lane road with 12-foot travel lanes and 8-foot shoulders. Route 135, for example, is a two-lane road as it enters Wellesley from Natick. It becomes a four-lane road in Wellesley and then goes down to two lanes as it enters Wellesley Square. Maintaining the two lanes throughout this stretch would allow more room for bicyclists. Turning lanes at the entrance of Wellesley College and at Oak Street could be included, as well.

Wide outside traffic lanes on some kinds of roadways, such as Route 9 in Natick and Framingham, would not be likely to attract many cyclists. Even many motorists find such roadways unattractive and uninviting.

Bicyclists: Other Design Issues

Parked cars present two problems to cyclists: (1) car doors opening into the traffic lane, and (2) parked cars decreasing horizontal sight distance at intersections and driveways. The first problem is a subset of the width problem, where cyclists may be forced too close to parked vehicles. While the second problem is related to width as well, it can be alleviated by removing specific parking spots that decrease sight distances at critical locations (intersections and driveways). Cars parked at an angle to the curb present an additional problem. The motorist backing out of such a space has a more restricted view than a motorist leaving a parallel parking spot.

Arterials with high levels of commercial activity, parking on both sides of the street, and high volumes of traffic present special problems. Route 135 in Wellesley Square is in this category. People driving on this type of road can become distracted if looking for stores or parking spaces. The parked cars obstruct the view for vehicles on the road as well as those entering the road from side streets or driveways.

Pavement condition is much more critical to bicyclists than motorists because bicycles are single-track vehicles with relatively narrow tires, and because of the relative lack of protection for bicyclists in falls. Pavement problems include potholes, other pavement deterioration, especially at edges, and abrupt drop-offs at the edge of pavement. A particular problem is the substandard repavings often done after roads

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[1] See *Guide for the Development of Bicycle Facilities*, American Association of State Highway and Transportation Officials, August 1991, pp. 13-15.

have been dug up for conduits or pipes. These diggings usually occur in the portion of the roadway used by bicyclists.

It is important to keep the outside areas swept. Early spring, when many bicyclists return to the road, is particularly critical. At that time of the year, sand left over from winter maintenance has accumulated and is swept to the outside of the travel lanes by passing motor vehicles. Bicycles, with only two tires, are less stable than their four-wheeled road sharers and can lose traction in sand. Experienced bicyclists will avoid the edge of the road if it is hazardous and move towards the center of the lane.

Other problems include drainage grates with openings parallel to the road that catch bicycle tires; traffic-signal actuators that do not detect bicycles; and yellow lights that do not allow sufficient time for bicyclists to traverse an intersection.

Pedestrians

The major road design issues for pedestrians are the provision of space for walking along the roadway and the opportunities given for crossing the roadway. Not only is a sidewalk desirable, but also space between the roadway and the sidewalk is important for safety as well as for aesthetics.

One could argue that a sidewalk is not essential on little-traveled roads, and residents sometimes fight against their construction on the grounds that the nature of the road and neighborhood becomes more urbanized. Having enough space for people to walk is essential, and is unfortunately not provided on some MetroWest roads. The lack of pedestrian pavement also adversely affects youngsters trying to bicycle, parents pushing baby carriages, and people in wheelchairs.

Facilities provided for pedestrians can lose their effectiveness due to lack of maintenance. Overhanging branches can decrease or even eliminate pedestrian space along a roadway. Obstructions within a walkway such as newspaper stands, light fixtures, and poles can decrease the usefulness and comfort of pedestrian areas.

The problems presented by parked cars discussed above also affect pedestrians. Pedestrians coming out from behind parked cars to cross the street are less visible to approaching motorists, and vice versa. Eliminating selected parking spaces that obstruct the view of crosswalks would help.

Barriers

One way to look at the issue of traffic circulation is to ask if there are barriers or places that bicyclists, pedestrians, and other non motorized modes avoid. There are natural barriers such as the Charles River or Lake Cochituate, where the expense of bridge or tunnel construction results in relatively few opportunities to cross. There are also man-made barriers such as Route I-90, where the policy of allowing unimpeded through traffic demands that local traffic go over or under or not go at all. Any large

development, such as a major mall, is a barrier if it is either inaccessible or forbidding to bicycle and pedestrian use.

Crossing these barriers, whether they are natural or man-made, is more of an issue for human-powered than motorized modes for two reasons. First, the effort and time required to go a few miles out of one's way to reach a crossing point are much greater for a bicyclist than a motorist, and even greater for a pedestrian. Second, the non motorized modes are more vulnerable at the crossing points, not being surrounded by a protective motor vehicle, and these crossing points can be particularly congested because they concentrate traffic. The resultant congestion and generally high traffic levels can put bicyclists and pedestrians at particular risk.

It is important that these crossings be built with human-powered travel in mind. They are more often than not built in such as a way as to discourage such travel, effectively becoming barriers within communities. Sidewalks and shoulders are often not maintained as well as the roadway and can be covered with sand and debris. Also, they are rarely plowed in the winter and may even serve as snow depositories.

Despite valiant attempts by many local planning boards, commercial developments are often built with only motorized modes in mind. There are many shopping malls in the MetroWest area, particularly in Natick and Framingham along Route 9. These developments, in general, acknowledge the pedestrian only after he or she has entered the front door. From the street to the parking lot, people on foot or on bicycles are in hostile territory. There are almost never any islands within parking lots to give people secure walks to the stores. There is virtually nothing to foster a sense of human scale, such as benches or trees or wide sidewalks that create some distance from the motor vehicles. These problems are obviously not MetroWest-specific, but are rather the result of suburban development throughout the country.

There are solutions that could make these areas more comfortable for human-powered travel. In some cases, paths can be created that avoid the busiest streets and intersections. The parking lots themselves could favor those out of their cars rather than those still in them, as discussed above.

A new shuttle bus service, called the ZEV (Zero Emission Vehicle), provides access along the Route 9 shopping corridor. Especially important markets for bus services to the shopping areas include the elderly, people with disabilities, and the young–those unable to drive themselves. The attractiveness of these options is affected by such obvious factors as frequency of service and dependability. It is also affected by the environment created for those waiting for the buses: benches and shelter from the elements.

B. Suitability Map

Background

The major focus of the steering committee during this study was the development of a bicycle suitability map for the MetroWest area (copy enclosed in back flap). The initial ratings of the road system were provided by the Central Transportation Planning Staff through consultation with members of the Bicycle Coalition of Massachusetts. These initial drafts were revised many times through discussions among steering committee members.

The individual community segments were then reviewed at the local level by police and other officials. Because the local reviews varied in how they were done and what was considered a suitable route, the overall regional consistency was diminished. A case in point is Needham, where many of the roads considered suitable by the committee were downgraded one or even two levels. The rating of streets in Needham is generally more conservative than that in the other communities. Reviews in the other communities resulted in minimal changes.

It must be remembered that some of the roads rated as suitable for experienced bicyclists would be very difficult for novice bicyclists. Also, the suitability of a road is very dependent on traffic conditions, weather, visibility, and other factors. The map should therefore be seen as a useful but limited guide to perceived bicycling conditions in the MetroWest area. It is essentially impossible for one map to provide all the information that is desirable, given the various levels of bicyclist expertise and the temporal variations in road conditions.

Community–by–Community Summary

A review of the map indicates at a glance the differences among the communities in terms of bicycle suitability of roads. (Again, caution must be exercised because these roads are subjectively ranked, often by different people, and comparisons are subsequently limited). Five communities that appear to have more roads rated as "best" for bicycling are Ashland, Dover, Sherborn, Southborough, and Sudbury. Those communities rated as having fewer "best" roads for bicycling are Framingham, Hudson, Marlborough, Natick, and Needham. Those that fall in between are Wayland, Wellesley, and Weston.

In Ashland, there simply aren't many roads, so some areas do not have many alternative routes available. Overall the ratings are relatively good. Dover is one of the better communities for bicycling-friendly roads. The character of the community is such that the roads are meandering country lanes. Although the roads are narrow, the lack of traffic allows fairly safe passing conditions, except during commuting hours, when motor vehicle volumes are high. Sherborn is very similar to Dover.

In Framingham, it is very difficult to go in a north-south direction. Some east-west routes are good. There are large barriers in Framingham, such as Route 9, the Mass. Turnpike, the reservoirs, and the rail lines. Also, many neighborhoods, especially in North Framingham, are cut off from each other. Small connecting paths would allow neighborhood children to visit without requiring either an adult to provide transportation or the children to bicycle or walk on unsuitable streets.

Good bicycling roads in Hudson and Marlborough are limited. There are some fairly good roads in the eastern and western ends of both communities. The rest of these communities, including the central areas, are difficult for bicycling. In Natick, there are no good north-south routes in the northern half of town. South of Route 135 is better, although there are still large areas without recommended routes. There is a relatively large number of "not recommended" roads.

In Needham, there are isolated roads that are good. The southeast and southwest portions of town are rated higher than the rest of town. In Southborough, good east-west travel is limited to the southern section of town. There are some good north-south routes, primarily on the west side of town. Barriers include the turnpike, I-495, Route 9, and the Sudbury Reservoir.

Bicycle circulation is better on the east side of Wayland than the west. East-west travel is particularly limited. There are some good roads in Wellesley for bicycling, and some major barriers, such as the turnpike, Route 9, and the MBTA rail line. It is easier to get from Wellesley to other communities than to get around within the town. Overall, Weston has good bicycling roads. East-west travel is also difficult here, however. The turnpike is a barrier, as are Routes 20 and 30, which allow bicycles, but are not recommended roadways.

Long–Range Planning

Besides being a guide for bicyclists today, the map can serve as a guide for future transportation projects. At both the regional and local levels, the map can help uncover areas where improvements are needed and where such improvements could make a large difference in bicyclists' ability to circulate within MetroWest.

The recently-enacted "Paulsen Bill" requires that when a highway is reconstructed, consideration for bicycle and pedestrian traffic needs to be considered whenever feasible.[2] All federally-funded highway projects are listed in a document called the Transportation Improvement Program (TIP). When a highway reconstruction is scheduled, it has to be listed in this document if it receives federal money. Local activists can peruse this list to determine what projects are upcoming and to contact the appropriate parties to help influence the design.

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[2] This bill is named after its sponsor, Rep. Anne Paulsen, Belmont.

Furthermore, local activists can help to influence the selection of projects by urging local officials to program projects that will help to improve the bicycling and pedestrian environment in MetroWest. These local requests are combined to form a regional list of projects, organized by MAPC. These regional recommendations are then forwarded to the MHD.

In 1991 the federal government passed the Intermodal Surface Transportation Efficiency Act (ISTEA) which earmarked funding for so-called enhancement projects. One of the categories available for enhancement funding is bicycle and pedestrian projects. The federal legislation also required that each state appoint a full-time bicycle-pedestrian coordinator. These federal initiatives have resulted in much local interest and activity in Massachusetts and across the country in bicycle and pedestrian projects.

Massachusetts has also been very supportive of bicycle projects. The Massachusetts General Court has provided funds for bicycle projects and trails in the Massachusetts State Transportation Bond Bills since 1975.

3 Off-Road Alternatives

Off-road alternatives are often divided into two types: railroad rights-of-way and natural corridors such as rivers. There is a third category consisting of aqueducts and other utility corridors. Because the MetroWest area is located between Boston and its major reservoir, the Quabbin, several aqueducts traverse the area.

What are the special features of rail, river, and aqueduct trails? A river path offers a lengthy, natural vista for path users. Also, because bridges are expensive, river crossings are minimized, so a path along a river has fewer intersections to traverse than a road parallel to the river . For example, a bicyclist on the Charles River Path needs to negotiate five intersections to go from the Museum of Science to Watertown Square. On the road system, that cyclist would need to go through about forty intersections. Also, the on-road cyclist would need to pass hundreds of parked cars; the path cyclist might not have to pass any. The option also exists for the path to go under the road crossings, as occurs at several of the Charles River Path bridges (including the Eliot, the Boston University, the Harvard, and the Longfellow).

The railroad right-of-way was built for trains, which had the right-of-way over other vehicles at intersections. Bridges were built to eliminate the necessity of having to stop other traffic, and for safety. The at-grade crossings had some type of physical barrier that prevented motor vehicles and others from getting in the way. Because of this separation, the sight distance of the crossing itself was less important than the sight distance of the warning system. That is, the train might cross a road at an oblique angle, at a spot difficult for road users to see. This was not an issue, as the key aspect of the crossing design was to set up the warning lights and markings so as to give road users plenty of warning to stop in time. On a rail right-of-way converted to a path, it is usually the path users that must stop at a crossing. Therefore, intersection sight distances and angle of crossing become more critical.

Trails along rivers and along railroad rights-of-way have been built in the metropolitan Boston area. To date, none have been built along aqueducts. The aqueducts are built to transfer water underground. Consequently, no consideration is given to sight distance at road crossings. Also, aqueducts often are raised above the landscape, and consideration therefore needs to be given to fencing in some areas when converting an aqueduct into a trail.

There is also the potential for short trails to greatly improve access and safety for walkers and bicyclists. This is possible where neighborhoods are cut off from each other because of the road layouts. To decrease through traffic, these neighborhoods end in cul-de-sacs. Without trail connections, people who live in one neighborhood are forced to go out to major streets to enter adjacent neighborhoods. These trips are usually made by car, given the distances involved. Short trails connecting these cul-de-sacs would allow only bicycle and pedestrian access and maintain the barriers for through motor–vehicle traffic.

There may also be places where a pedestrian bridge could eliminate a barrier to pedestrian travel. A barrier, as discussed above, can not only inconvenience people, but effectively eliminate access for those unable to make a longer trip. Populations particularly vulnerable to this are the elderly, the handicapped, and children.

A. Railroad Rights-of-Way

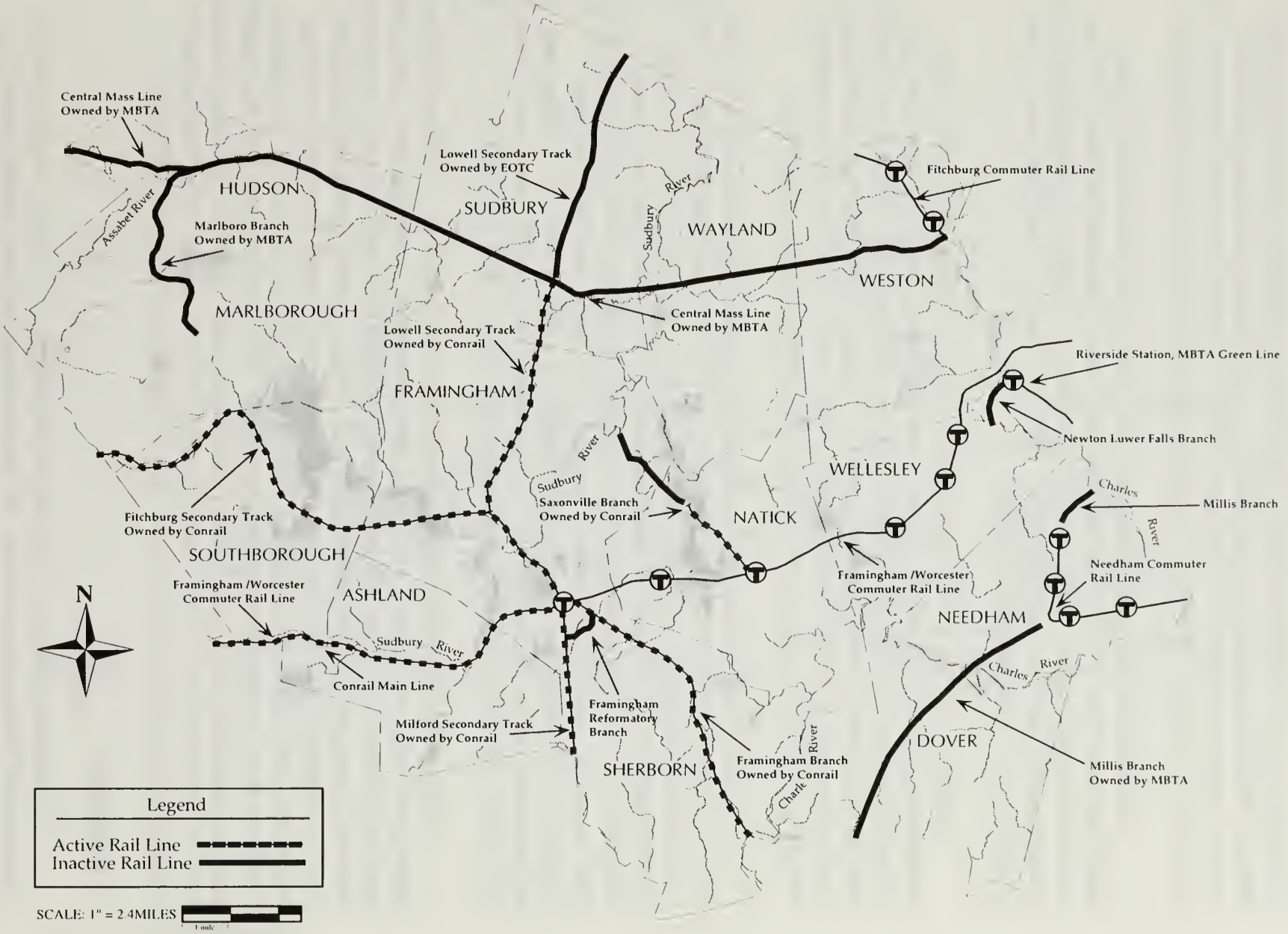
There are several railroad rights-of-way in the study area that could become trails. Figure 2 indicates these lines. They are the Central Massachusetts, the Lowell-Sudbury, the Riverside Connector, the Marlborough right-of-way (the Assabet River-Rail Trail), and rights-of-way in Sherborn and Ashland.

One of the most promising is the Central Massachusetts Line, referred to as the "Central Mass." This is an abandoned line, running through the entire study area, from Weston to Hudson. The MBTA owns a section over 20 miles long that extends east of the study area to Waltham and west to Berlin. The original line went from Cambridge to Northampton. The Central Transportation Planning Staff has begun a feasibility study of this line, to be completed in early 1997.

A feasibility study was completed in 1987 on the Lowell-Sudbury line (Lowell Secondary Track). The conclusion was that a trail on this line is feasible. Objections from abutters, especially in the Sudbury area, put the project on hold. The Massachusetts Highway Department is in the process of hiring a consultant to do preliminary design for the northern 7.2 miles of this proposal. This segment, in Lowell, Chelmsford, and Westford, is outside the study area. The right-of-way is owned by the Executive Office of Transportation and Construction (EOTC). The entire proposed trail would run north from Sudbury to Concord, Acton, Westford, and Chelmsford, ending in Lowell. It would cross the proposed Central Mass. trail in Sudbury. Most of the line is abandoned; there is no active rail service on the line.

The proposed Assabet River Rail Trail (ARRT) would start in Marlborough, go north to Hudson, and proceed outside the study area into Stow and Maynard, ending in South Acton, adjacent to the commuter rail station there. The potential trail, which would use parts of the former Marlborough Branch Railroad (long abandoned), would cross the Central Mass. line in downtown Hudson. Parts of the right-of-way are

FIGURE 2
Railroad Rights-of-Way



privately owned. The MBTA owns the right-of-way in Hudson and most of the Acton section. Marlborough has received Public Works/Economic Development (PWED) funds to acquire the right-of-way from the MBTA. Stratus Computer Corporation plans to use part of the right-of-way to build an access road and has agreed to include a trail.

Volunteers from a group promoting the Assabet Trail have cleared brush, assembled assessors' maps, talked to landowners, and presented the concept to local boards and organizations. There are approximately 20 at-grade crossings and five river crossings along the 12-mile right-of-way. CTPS has drafted a feasibility study of the project, due to be distributed in late 1996.

Another project is a short right-of-way called the Riverside Connector: the abandoned Newton Lower Falls Branch, from Wellesley Lower Falls to the MBTA's Riverside Station. The Metropolitan District Commission (MDC) owns the right-of-way and the MHD owns the bridge over Route 128. This potential trail would connect the Route 16 corridor in Wellesley to the MBTA's Riverside Green Line and express bus service to Boston. The right-of-way includes a crossing of the Charles River.

A right-of-way that begins near the Framingham commuter rail station could become a trail. It heads south into Sherborn, thence southwest out of the study area into Holliston, ending near Milford Center. This line is owned by Conrail. It had a freight user that recently went out of business, so it is neither active nor formally abandoned. Conrail has expressed interest in selling the line. From Milford Center there is another possible trail (mostly outside of the study area) that goes into Hopkinton, then turns east into Ashland, ending at Ashland State Park. These two rights-of-way are being proposed by a group called the Upper Charles Conservation Land Trust. This study will be completed in the winter of 1997 by MAPC.

There are some railroad rights-of-way that carry freight on an infrequent basis. If the right-of-way is sufficiently wide, then joint use may be possible, where a trail is built parallel to an active rail line. Citizens from Natick and Framingham have begun to look into such a proposal for the Saxonville Branch, which presently provides freight service from the vicinity of Natick Center to Speen Street near Route 9. Another low-usage freight line is the Millis Branch, which goes through the study area from the Newton-Needham line, uses the same right-of-way as the Needham commuter rail line, and then goes through Dover, ending in Millis. There is also some interest in restoring commuter rail service on this line. Another active freight line is the section from Framingham to Sudbury. North of the active section is the Lowell-Sudbury, mentioned above.

B. <u>Aqueducts</u>

To the west of the study area lie two major sources of water, the MDC-owned Quabbin and Wachusett reservoirs. Within the study area, and located primarily in Southborough and Framingham, are the Sudbury Reservoir and Framingham Reservoir

FIGURE 3
Aqueduct Rights-of-Way

#3. Because MetroWest lies between these water sources and the major population center of the state, four aqueducts traverse the study area: the Weston, the Hultman, the Cochituate, and the Sudbury (see Figure 3).

The Weston Aqueduct, dating from 1903, runs from the eastern edge of Southborough through Framingham and Wayland to Weston. The Hultman Aqueduct is just south of the Weston, running through the same towns. The Cochituate Aqueduct, completed in 1848, begins in Natick and proceeds through Wellesley into Newton. The Sudbury Aqueduct, built in 1878, begins in Framingham and proceeds through northern Sherborn into South Natick and along the Wellesley-Needham border to Newton, ending at the Chestnut Hill Reservoir in Brighton.

The MWRA has indicated that it would consider trail use of its aqueducts when they go off-line. The Weston and Sudbury aqueducts are scheduled to go off-line in 2004. The Cochituate, owned by the communities within their respective boundaries, is already off-line. The Hultman, which will continue to be used as an aqueduct, will be augmented by the new deep-rock MetroWest Tunnel.

In an environmental review process, the Bicycle Coalition of Massachusetts (BCOM) commented that existing aqueducts are being used as trails and that the MWRA should address this use. The policy of the MWRA has been to post "No Trespassing" signs. The Secretary of Environmental Affairs, in her findings of August 15, 1994, agreed that these long-range management issues deserve further attention and encouraged the MWRA to work with the BCOM and the MetroWest Growth Management Task Force to this end (Project 8107).

Given the municipal ownership of the Cochituate Aqueduct and community interest in pursuing trail use, primary consideration should be given to the Cochituate for trail development. This project could help determine the usefulness of other aqueducts for trail use, and the best way to develop them. One important issue that has already come up in Wellesley is whether to pave or not. Proponents of paving cite the increased populations that would be able to use the aqueduct, including bicyclists, people in wheelchairs, baby strollers, and skaters. Opponents of paving want to keep the aqueduct as is, for walking, and discourage the faster skating and bicycling modes, as well as keep the sheer number of users down.

The next most likely candidates are the Sudbury and Weston aqueducts. In these cases, the towns would need to petition the MWRA to begin planning of trails, construction of which may have to wait until these aqueducts go off-line in 2004.

Besides the types of issues cited above regarding aqueduct trails, there is one more to consider. In some cases, the easement for the aqueduct is for the right to place the aqueduct under the surface. In such cases, for a trail to be established, a new easement allowing for surface use of the corridor would have to be obtained.

4 Intermodal Connections

Bicycling and walking can be used to access other modes. There are a number of public transportation services available to MetroWest residents, workers, and visitors.

The primary transit mode in the study area is commuter rail. Three commuter rail lines have a total of twelve stations within the study area: the Fitchburg Line (stations at Hastings and Kendal Green, both in Weston), the Framingham/Worcester Line (stations at Framingham, West Natick, Natick, Wellesley Square, Wellesley Hills, and Wellesley Farms), and the Needham Line (stations at Needham Heights, Needham Center, Needham Junction, and Hersey).

There are plans for new commuter rail stations. The MBTA is designing a new station in Weston, near Route 128, which will be on the Framingham/Worcester line. That line presently runs express from Framingham to Worcester. Intermediate stations are in the planning stage for Ashland, Southborough, Westborough, Grafton, and Millbury.

Table 5 indicates the mode that people use to reach the existing twelve commuter rail stations. As can be seen, the walk mode has a healthy share. At 75 percent of the stations, over a third of users walk to the train. The share is over half at Needham Heights, Needham Center, and Wellesley Hills, and almost half at Natick and West Natick.

The bicycle mode is part of the "other" category, which also includes taxi and bus transit. Even if all users in this "other" category bicycled to the station, it would be only on the order of one percent.

There are no other MBTA services within the study area, although Riverside Station, with Green Line and express bus services, is adjacent to the Weston border. The Mass Turnpike Authority has a park-and-ride facility in Framingham. Massport has a park-and-ride lot in Framingham with express bus service to Logan Airport. Two private bus companies serve the area. Gulbankian has service from Hudson, Marlborough, Southborough, and Framingham. Peter Pan has service from Framingham, Natick, and Wellesley. There is no information available regarding the modes people use to reach these services and facilities.

Table 5
Access Mode to Commuter Rail Stations

Commuter Rail Station	Access Mode (# (%))				
	Walk	Park	Drop-off	Other*	Total
Fitchburg/S. Acton Line					
Kendal Green	14 (14.1)	67 (65.9)	17 (16.6)	3 (3.1)	101 (100)
Hastings	6 (46.1)	6 (46.1)	1 (7.6)	0 (0.0)	13 (100)
Framingham/Worcester Line					
Wellesley Farms	115 (29.3)	221 (56.6)	55 (14.0)	0 (0.0)	391 (100)
Wellesley Hills	176 (58.7)	79 (26.4)	42 (14.0)	2 (0.7)	299 (100)
Wellesley Square	261 (38.3)	332 (48.8)	83 (12.1)	5 (0.7)	681 (100)
Natick	252 (45.1)	194 (34.7)	112 (20.0	0 (0.0)	558 (100)
West Natick	291 (45.9)	244 (38.5)	97 (15.2)	2 (0.3)	634 (100)
Framingham	127 (13.3)	584 (61.5)	201 (21.2)	36 (3.8)	948 (100)
Needham Line					
Hersey	197 (36.3)	294 (54.3)	46 (8.4)	5 (0.8)	542 (100)
Needham Junction	134 (33.9)	187 (47.4)	70 (17.6)	4 (0.9)	395 (100)
Needham Center	95 (53.3)	60 (33.8)	17 (9.5)	6 (3.2)	178 (100)
Needham Heights	101 (67.0)	29 (19.4)	20 (13.4)	0 (0.0)	150 (100)
Total	**1,769 (36.2)**	**2,297 (47.0)**	**761 (15.6)**	**63 (1.3)**	**4,890 (100)**

*Including bike.

Source: 1993 Passenger Survey, for MBTA by CTPS

A. Parking

Table 6 indicates both the bicycle parking available and the number of bicycles observed parked at the commuter-rail stations. For the latter, each number represents a different day of observation. Counts were taken only on weekdays that would be considered good for bicycling in terms of season and weather.

Many travelers cannot bicycle to a rail station. Reasons for ruling out the bicycle that are difficult or impossible to overcome include physical inability, too much time or distance, and the need to drop off (and pick up) children. There are other things that prevent people from cycling that can be addressed, such as fear of theft or vandalism of the bicycle, inability to shower or change clothes at work, perceived lack of safety on the roads leading to the station, and simply not considering the option.

The town of Acton, using money from the federal Intermodal Surface Transportation Efficiency Act (ISTEA), installed twenty bicycle lockers at the South

Table 6
Bicycle Parking at Commuter Rail Stations

Commuter Rail Station	# Bicycle Racks	# Bicycles Parked*
Fitchburg Line		
Kendal Green	0	1, 0
Hastings	0	0, 0
Framingham/Worcester		
Wellesley Farms	0	0, 1
Wellesley Hills	0	0, 0, 1
Wellesley Square	1	3, 2, 2
Natick	0	5, 3, 3
West Natick	0	0, 1
Framingham	0	7, 9, 3
Needham Line		
Hersey	6	3, 4
Needham Junction	6	0, 2
Needham Center	6	1, 0
Needham Heights	6	1, 0

*Each number represents a different day of observation.

Acton commuter rail station in May 1996. The town is making the lockers available free of charge for the first year (requiring a $50 returnable key deposit) to encourage interest and use. All the lockers were taken in a short time.

The Acton experience could help the MBTA to consider additional lockers. A pilot program would be a useful way to begin, targeting stations that are readily accessible by bicycle, with short-term accessibility improvements made as possible. Although bicycle lockers are more expensive than simple racks, the lockers do provide maximum security. They prevent vandalism and protect the bicycle from weather. Also, they can be rented to recoup the cost. At the same time, secure and easy-to-use bicycle racks ought to be installed at stations in visible locations where some activity occurs during the day, thereby discouraging vandalism and theft as much as possible. Some stations, such as Wellesley Hills and Natick, are located in areas that have more activity nearby, and racks could be more effective there than in more remote stations such as Wellesley Farms. It is desirable to cover racks for protection from the weather.

A bicycle parking program needs to be accompanied by an aggressive marketing campaign to encourage people to try the commute to the station by bicycle or by walking. That campaign should include information on the air quality benefits of

eliminating short motor-vehicle trips, as well as the exercise and financial benefits of bicycling or walking. This campaign could be particularly useful at stations where the automobile parking spaces are filled early and where much unmet parking demand exists. Table 7 indicates commuter rail riders' opinions of automobile parking availability at study area stations. As can be seen, the stations with the highest percentage of users dissatisfied with parking availability are Framingham, West Natick, and Natick.

Table 7
Opinions Regarding Automobile Parking Availability, Commuter Rail Stations

Commuter Rail Station	Number Responding	Opinion in Regard to Parking Availability (%)				
		Very Poor	Below Average	Average	Above Average	Usually Good
Fitchburg/South Acton						
Kendal Green	86	10	10	20	29	30
Hastings	9	0	0	33	44	22
Framingham/Worcester						
Wellesley Farms	327	10	13	28	27	23
Wellesley Hills	216	13	36	22	12	15
Wellesley Square	591	11	13	23	33	20
Natick	482	34	30	21	9	6
West Natick	583	40	24	19	11	6
Framingham	895	48	22	18	7	4
Needham						
Hersey	501	2	5	17	30	46
Needham Junction	359	9	16	26	31	19
Needham Center	131	12	11	27	30	20
Needham Heights	125	24	26	21	12	16

Source: 1993 Passenger Survey, done for MBTA by CTPS

B. Bicycles on Transit

Present MBTA policy allows bicycles on all off-peak commuter rail trains. This information should be included in the marketing campaign for a bicycle parking program. For the Framingham/Worcester Line, this means that eleven of the seventeen inbound daily trips, departing Framingham from 8:35 AM to 12:05 AM (a fifteen-and-one-half-hour span), are bicycle-accessible. Only the peak-period trips, from 5:45 AM to 8:00 AM, are not available to bicycles. For the return trip, bicyclists may board the

seven trips departing between 5:50 AM and 2:40 PM, and the four trips in the evening between 6:55 PM and 11:05 PM. The six peak-period trips are not available.

The case is similar for the other commuter rail lines in the study area. On the Fitchburg/South Acton Line, bicycles may be carried inbound on the latter eleven of the sixteen trains, and outbound on the first seven and last four. On the Needham Line, the latter twelve of the seventeen inbound trips are available, as well as the first eight and last four outbound. This type of schedule is particularly ideal for reverse commuting. (It should be noted that bicycles cannot be transported to and from Worcester, because there are no off-peak trains yet serving that city.)

Bicycles may be boarded on all weekend commuter rail trains.

The nearby Riverside Station has Green Line and express bus service. There is no bicycle access on the Green Line or on MBTA buses. (There is access available on the other three rapid transit lines. It is more limited than that available on the commuter rail system.)

The private bus carriers, Gulbankian and Peter Pan, will transport bicycles, unboxed, at no charge. Peter Pan officially requires them to be boxed, but personnel at the company say this is not enforced.

C. Access to Stations

To encourage bicycle and pedestrian access to public transportation, there have to be reasonably safe and pleasant ways to reach stations and other intermodal facilities. There is no point in providing good parking facilities for bicycles if the bicyclists cannot easily reach them. Reasonable distances for station access are up to one mile for walking and up to three miles for bicycling. While many could and do go much farther, these distances represent about 15 minutes of travel time. Much more time would be prohibitive for the majority of users to devote to a feeder mode. Interestingly, however, many view the walk or bicycle portion of their commute (which might be their entire commute) as a form of exercise, as a pleasant experience, and don't calculate the travel time the usual way. The bicycle ride or walk is not only pleasant, it also allows more freedom by eliminating the possibility of getting stuck in a traffic jam.

For bicycle access, each station and intermodal facility in the study area needs to be looked at from the point of view of population centers and the bicycle suitability map. That is, priority should be given to streets that would provide access to the most people. The bicycle suitability map helps identify which stations now have reasonable access from which directions. Some stations may be made more easily accessible with minor modifications to adjacent streets, others with major reconstructions of them. Some changes might be financially or politically unlikely. The point is to improve access in as cost-effective a way as possible.

For both bicycle and pedestrian access, short paths could be constructed in some cases to provide access. The potential rail right-of-way connection in Wellesley to Riverside Station is an example of this type of improvement. There may be other shortcuts that could be built that would provide neighborhoods with non motorized access to stations. The existing path in Wellesley is a good example. It allows bicyclists and pedestrians to reach Wellesley Square and Wellesley Hills stations without using the busy and often narrow Route 16 corridor. The best connecting routes from the path to the stations (both Wellesley Square and Wellesley Hills) need to be signed, to help path users reach those destinations.

Priority should be given to trails that can provide bicycle and pedestrian access to public transportation facilities. Trail facilities that would fall into this category include the Riverside Connector, the Cochituate Aqueduct, the Assabet River Rail Trail and the Central Mass. Line.

5 Recommendations

The MetroWest Bicycle-Pedestrian Steering Committee has been meeting for the past four years with an ultimate aim of making MetroWest a safer, more pleasant place to bicycle and walk. A first step in that process, and a demanding and tedious one, has been completed: the publication of the enclosed MetroWest Bicycle Map. It is now important to use that map and other information gathered in this study to take steps to make MetroWest a better place for walking and bicycling.

The strongest recommendation of this report is that the work done by the MetroWest Bicycle–Pedestrian Steering Committee be strengthened and expanded. It is important that this committee continue to exist, not only to distribute and update the MetroWest bicycle map, but also to serve as a regional guide for bicycle and pedestrian improvements in the area through municipal-level committees.

It is possible for this study to recommend specific treatments or projects. It is better, however, for these recommendations to come from local initiative. It is therefore critical that the MetroWest Bicycle–Pedestrian Steering Committee work to develop bicycle–pedestrian committees at the local level. These local committees could perform many tasks that are, for the most part, not being done now.

On-Road Improvements

First, the local committees need to be involved in project reviews where the potential to incorporate bicycle and pedestrian improvements exists. The reality of the situation is that bicycle and pedestrian considerations are often left out by designers who are not aware of these issues. While initiatives at the federal and state levels, as incorporated in the federal ISTEA legislation of 1991 and in the 1996 Paulsen Bill in Massachusetts, are pushing in the direction of more consideration of walking and bicycling, strong local review is necessary.

The projects to be reviewed might come from local and state highway departments, the MBTA, or private developers. The federal government requires a listing of all projects that are to receive federal transportation dollars. This document, called the Transportation Improvement Plan (TIP), has an annual element, for projects to be advertised for construction in the next year, as well as a listing of projects scheduled for construction in the ensuing two years. The TIP, available from local officials or through CTPS or MAPC, indicates projects early enough in the planning process for citizens to have their views heard.

An ideal time to incorporate road improvements is during a major reconstruction. Such as opportunity exists for the Route 135 corridor now. Types of possible improvements include minor widenings, especially in areas where a road narrows, new lane markings to favor a wider curb lane, and improved geometrics at intersections to facilitate pedestrian crossings.

Bicycle and pedestrian interests need to make their general and specific concerns known to local, regional, and state officials. Local planning boards, conservation commissions, and police departments, for example, make decisions that affect these modes, and local bicycle-pedestrian committees would do well to recruit members from these boards and departments. Members of the General Court, both senators and representatives, also can be invaluable allies.

Off-Road Improvements

A second major role of the local committee is to support specific bicycle and pedestrian projects. There are projects, such as the Assabet River Rail Trail and the Central Mass. Line, that are receiving state and regional attention because of the actions of local advocacy groups. The Assabet project has been brought forward by the efforts of volunteers through the Assabet River Rail Trail Organization. That study was requested by all the communities involved: Marlborough, Hudson, Stow, Maynard, and Acton. The city of Waltham has been instrumental in galvanizing support for the feasibility study of the Central Mass. right-of-way. The chief elected officials in Belmont, Waltham, Weston, Wayland, Sudbury, Hudson, and Berlin formally requested that study. The Upper Charles project likewise has received strong local support through the efforts of the Upper Charles Trust. Holliston, Hopkinton, Sherborn, Medway, Milford, and Framingham have indicated their support for that feasibility study.

There are many off-road possibilities in the MetroWest area, as delineated in Chapter 4. Moving any of these into design and construction is primarily a local decision. Even if regional or state levels of government were to initiate one of these projects, the decision to go forward or not would ultimately be a local one. And the chances of success at the local level will depend on the degree and visibility of support.

It is also true that some projects are of benefit at the regional level and others are of a more local nature. It is important that the MetroWest Bicycle-Pedestrian Steering Committee develop its own sense of priorities and relay those to the MetroWest Growth Management Committee and MAPC. Help is available on these regional initiatives from advocacy groups such as Walk Boston and the Bicycle Coalition of Massachusetts. Information on how to reach these organizations as well as pertinent state, regional, and local agencies is located in Appendix C of this document.

The MetroWest Bicycle-Pedestrian Steering Committee could approach the Massachusetts Water Resources Authority (MWRA), with help from other agencies, organizations, or communities, to discuss the possibilities for aqueduct trails. Could the

MWRA allow trail use on active aqueducts, or aqueducts that are available for emergency use only? Could the MWRA help in the development of trails? What are the concerns of the MWRA that have prevented more community use of these facilities?

The Assabet, Central Mass., and Upper Charles rail trail projects are clearly of a regional nature. Projects of limited geographic scope, such as the Riverside Connector, are regional insofar as they connect to the regional transit system.

Intermodal Connections

A local committee can pinpoint areas where improved bicycle and pedestrian access can help reach MBTA and other public transportation services. Even communities with no stations or intermodal connections can work with adjoining communities that do have these connections to improve routes and parking facilities for their citizens. Priority could be given to trails and to road improvements that do provide good access to these intermodal connections.

A possible initiative would be a study and marketing campaign in conjunction with the MBTA to target access to MetroWest commuter rail stations. Such a study could identify those stations that have the highest potential for increased bicycling and walking or have the most pressing safety and access needs. One or two stations could be identified for a marketing campaign, in conjunction with improved bicycle parking and access improvements.

Local committees can forge partnerships between the community and the MBTA or other entity providing the transit service to assess the needs and to look for innovative ways to fund whatever improvements are found most desirable. It may be possible, for example, for local businesses or organizations to help front money for lockers, knowing that their investments will be paid back over time through rentals. Likewise, private entities may be found to administer the locker rental programs.

Comprehensive Programs

Bicycle and pedestrian issues are sometimes defined by the four E's: engineering, education, enforcement, and encouragement. Given the transportation orientation of this report, the emphasis is on physical facilities, or engineering. It is extremely important, for an effective program, that the other three E's receive attention. And it is important that education programs be designed for specific audiences, be they pre-schoolers or adults, bicyclists, pedestrians, or motorists.

In all of the actions available to the local committees, the study of accident data can be very useful. The data included in this study can be augmented with more up-to-date data available through the local police departments. These data can throw light on the causes of local bicycle and pedestrian accidents, can further delineate high-accident locations, and can help determine courses of action that will help increase the safety—and pleasure—of bicycling and walking in these MetroWest communities.

APPENDICES

Appendix A

List of Steering Committee Meetings

These are meetings of the MetroWest Bicycle-Pedestrian Steering Committee, unless otherwise noted.

July 14, 1992	MetroWest Transportation Task Force
November 4, 1992	
December 2, 1992	
February 17, 1993	
March 3, 1993	
March 18, 1993	Public Meeting, Natick
April 7, 1993	
April 28, 1993	
May 19, 1993	
June 2, 1993	Public Meeting, Marlborough
June 17, 1993	Public Meeting, Wellesley
June 23, 1993	
July 21, 1993	
August 25, 1993	
September 29, 1993	
October 20, 1993	
January 5, 1994	
January 26, 1994	
March 2, 1994	
April 6, 1994	
April 20, 1994	
May 25, 1994	
July 28, 1994	
October 12, 1994	
February 9, 1995	
March 2, 1995	
August 23, 1995	
February 15, 1996	
March 14, 1996	
July 8, 1996	
August 21, 1996	

Appendix B

Bicycle-Pedestrian Accident Maps
MetroWest Communities

FIGURE B1
Ashland Bicycle and Pedestrian Accidents
1989-1991 Inclusive

LEGEND

- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

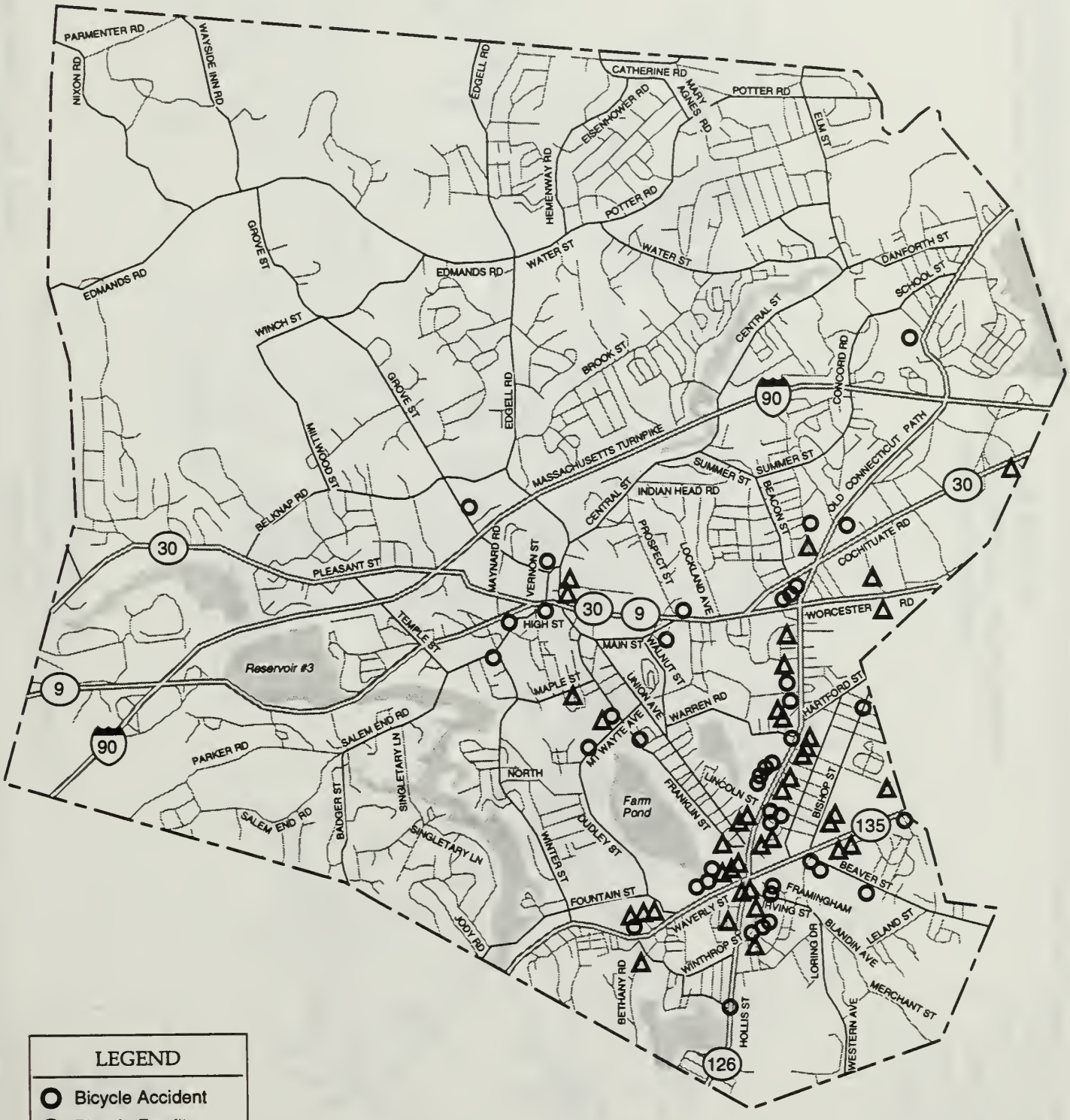
FIGURE B2
Dover Bicycle and Pedestrian Accidents
1989-1991 Inclusive

LEGEND

- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

FIGURE B3
Framingham Bicycle and Pedestrian Accidents
1989-1991 Inclusive



LEGEND

- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

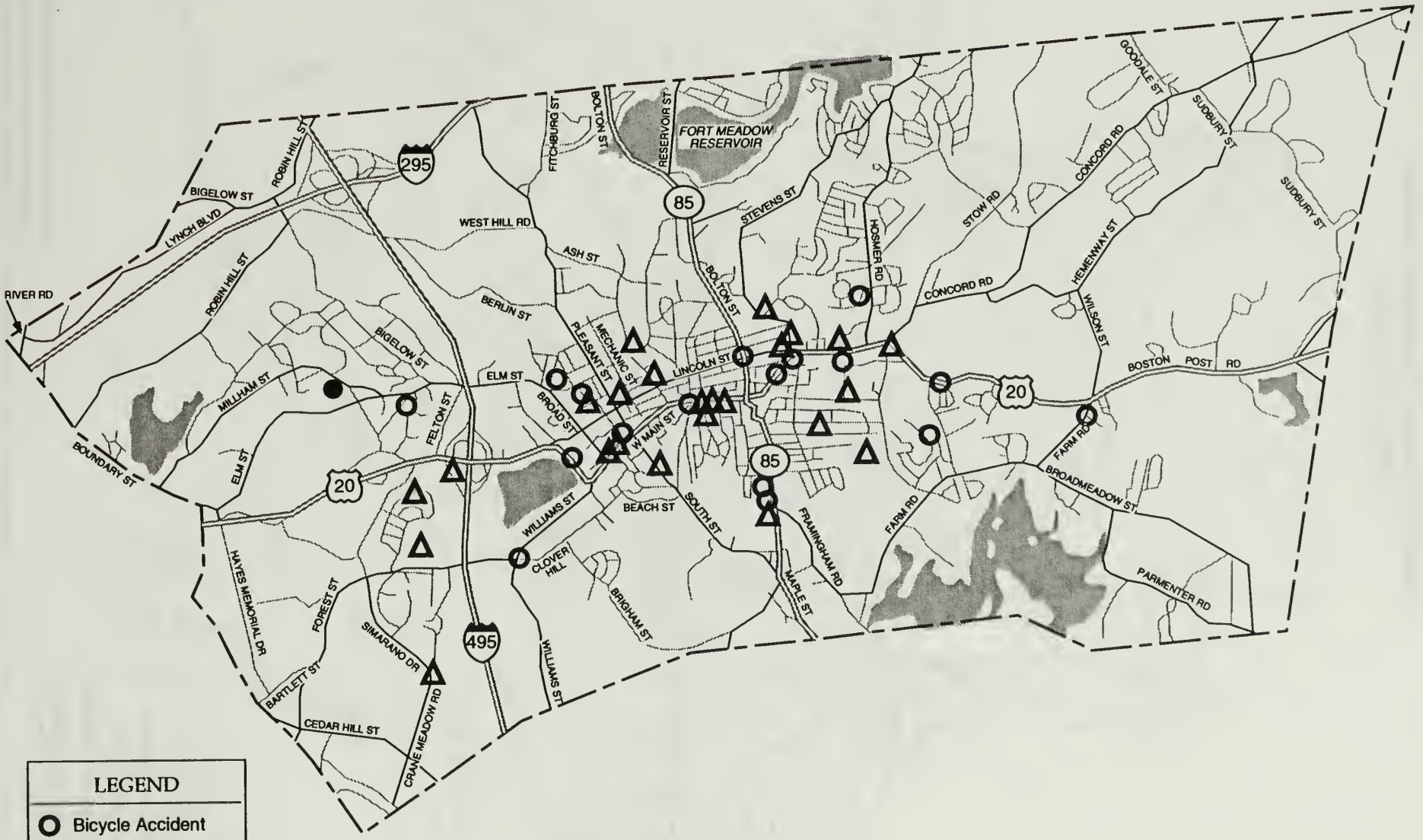
FIGURE B4
Hudson Bicycle and Pedestrian Accidents
1989-1991 Inclusive

LEGEND

- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data,
processed by Massachusetts Highway Department

FIGURE B5
Marlborough Bicycle and Pedestrian Accidents
1989-1991 Inclusive



Source: Registry of Motor Vehicles data,
processed by Massachusetts Highway Department

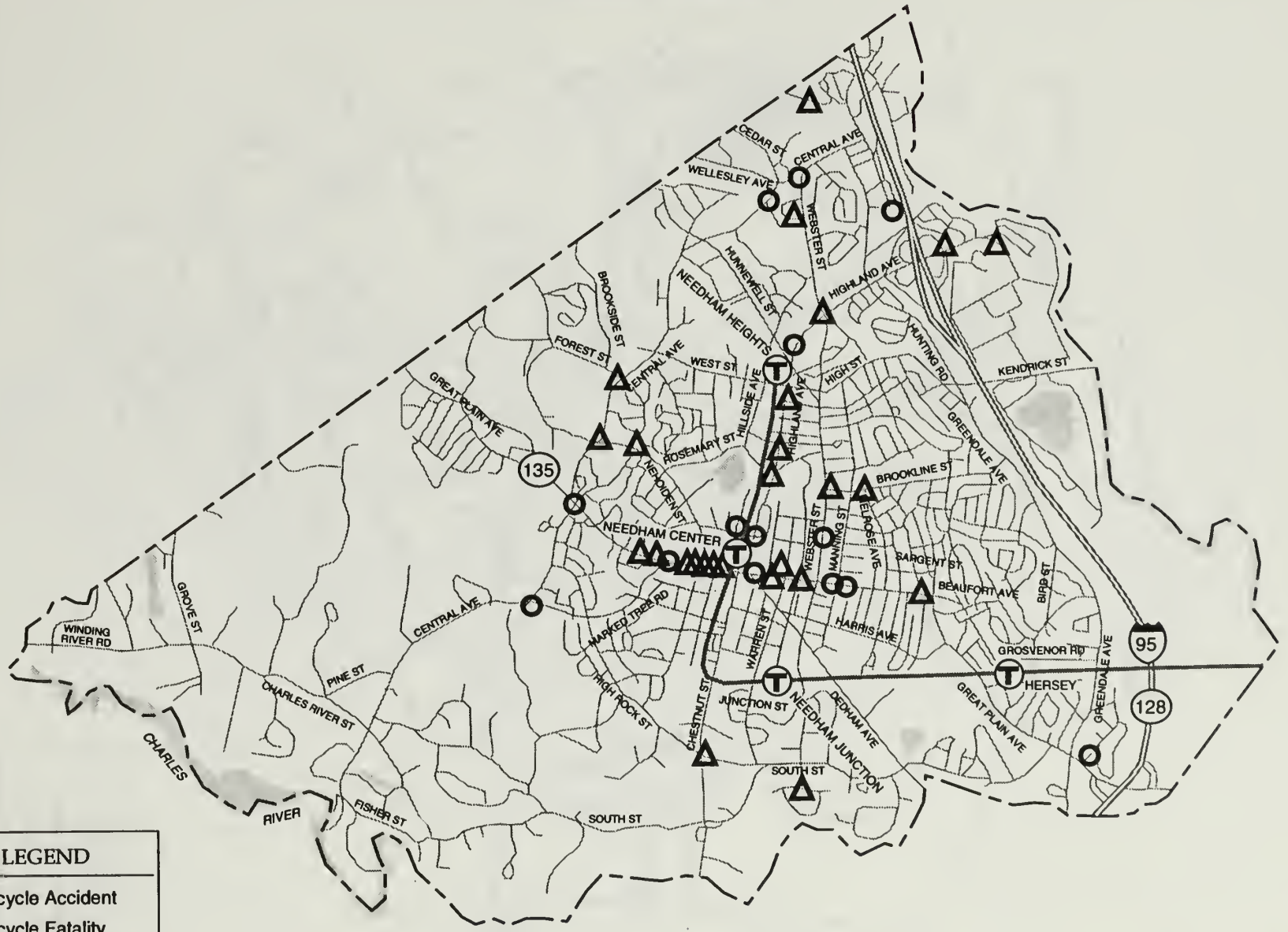
FIGURE B6
Natick Bicycle and Pedestrian Accidents
1989-1991 Inclusive

LEGEND

- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

FIGURE B7
Needham Bicycle and Pedestrian Accidents
1989-1991 Inclusive



Source: Registry of Motor Vehicles data,
processed by Massachusetts Highway Department

FIGURE B8
Sherborn Bicycle and Pedestrian Accidents
1989-1991 Inclusive

LEGEND

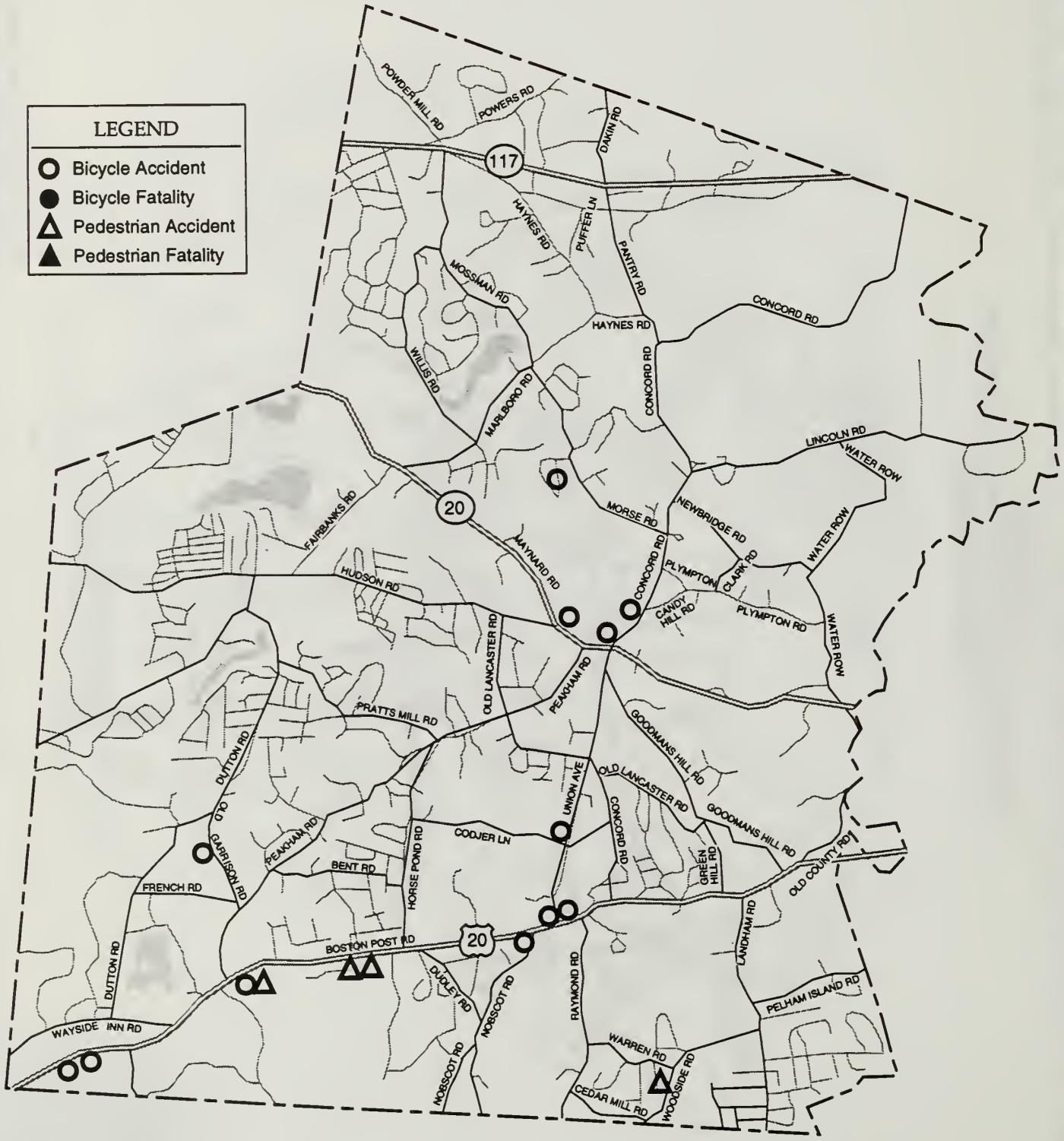
- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

FIGURE B9
Southborough Bicycle and Pedestrian Accidents
1989-1991 Inclusive

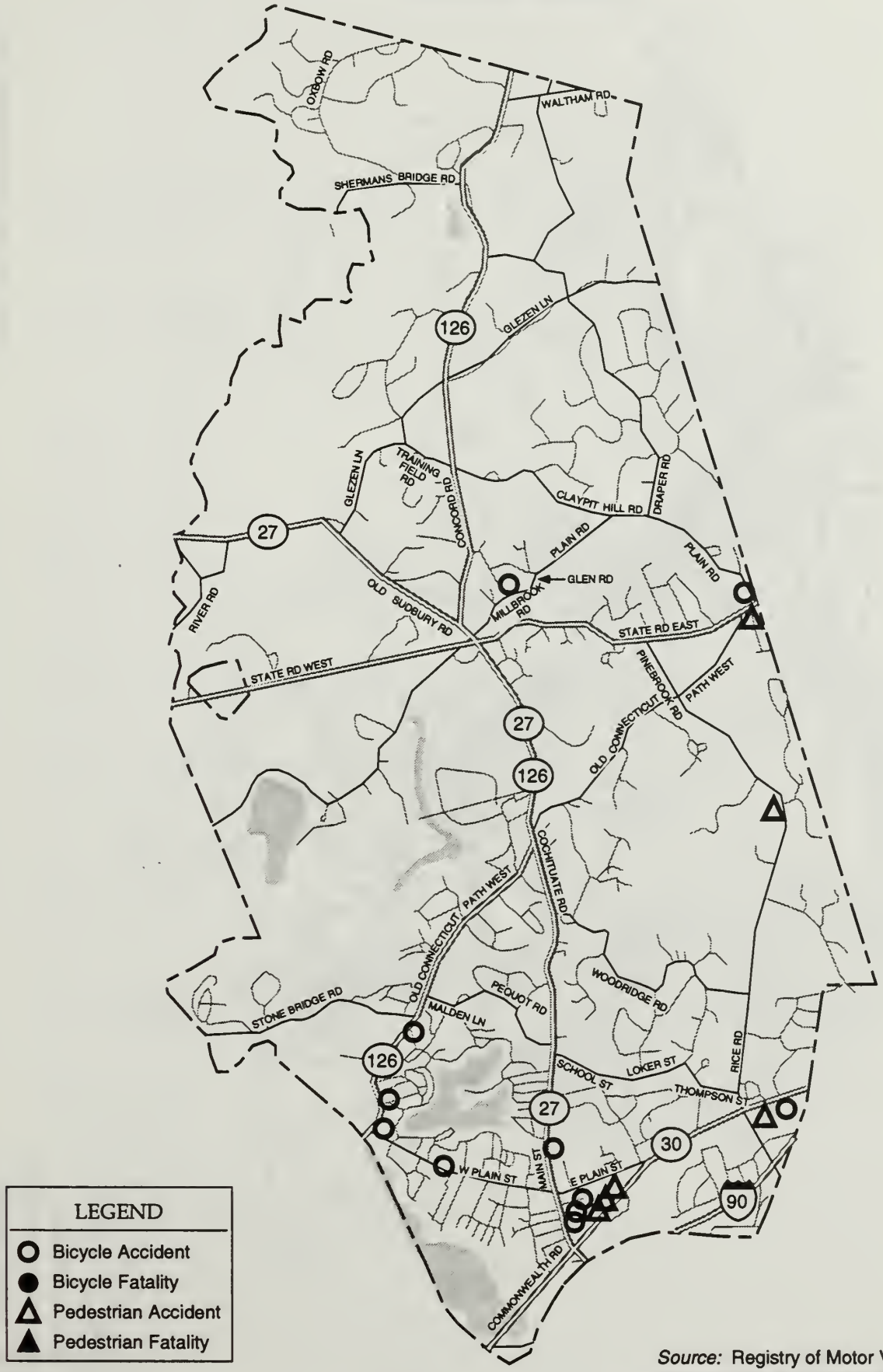
Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

FIGURE B10
Sudbury Bicycle and Pedestrian Accidents
1989-1991 Inclusive



Source: Registry of Motor Vehicles data,
processed by Massachusetts Highway Department

FIGURE B11
Wayland Bicycle and Pedestrian Accidents
1989-1991 Inclusive



LEGEND

- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

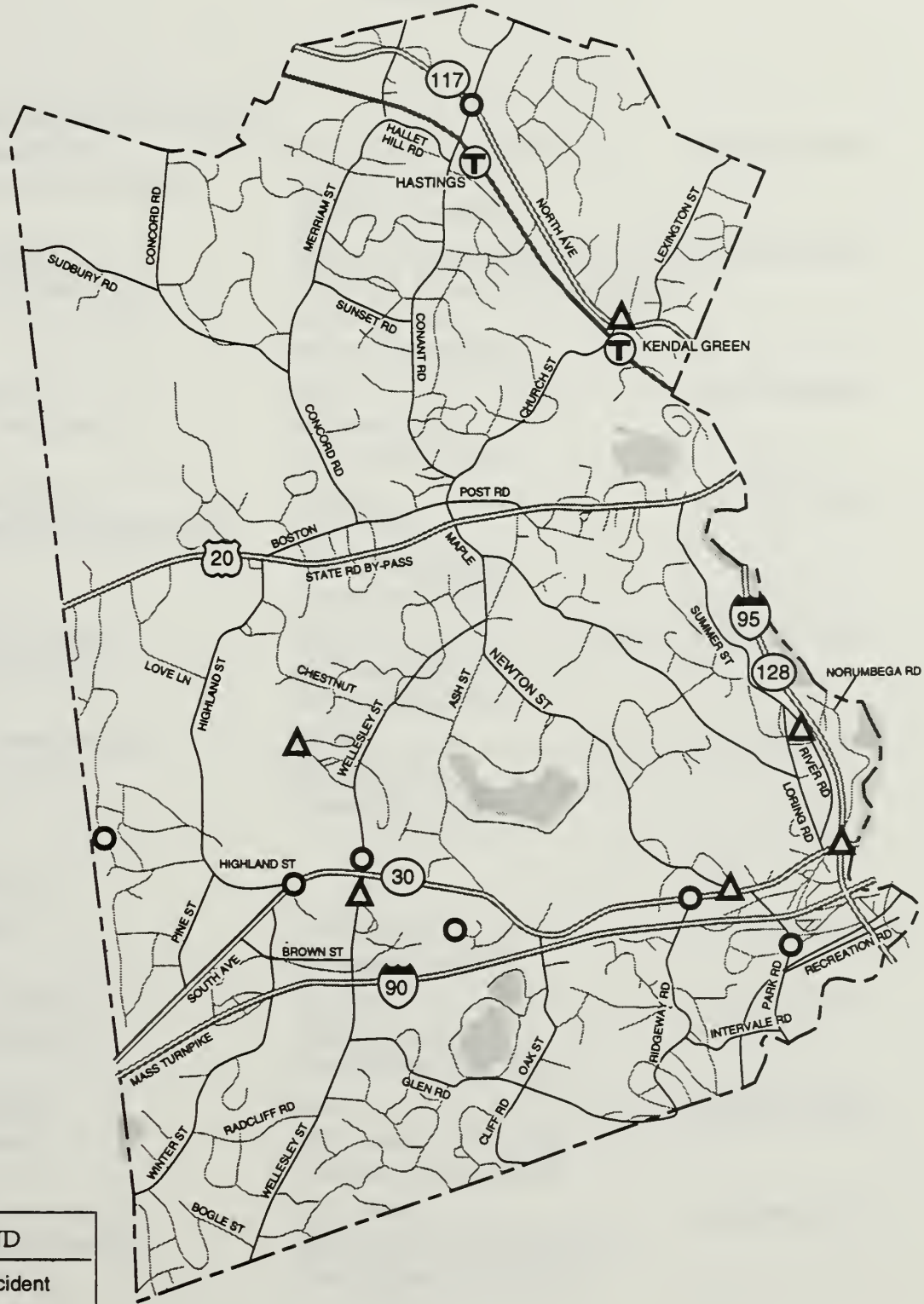
FIGURE B12
Wellesley Bicycle and Pedestrian Accidents
1989-1991 Inclusive

LEGEND

- Bicycle Accident
- Bicycle Fatality
- Pedestrian Accident
- Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

FIGURE B13
Weston Bicycle and Pedestrian Accidents
1989-1991 Inclusive



LEGEND
Bicycle Accident
Bicycle Fatality
Pedestrian Accident
Pedestrian Fatality

Source: Registry of Motor Vehicles data, processed by Massachusetts Highway Department

Appendix C

Resources

State and Regional Government

Massachusetts Bay Transportation Authority	MBTA Planning Dept. .....(617) 222-5894 10 Park Plaza Boston, MA 02116
Massachusetts Highway Department	Bureau of Transportation.....(617) 973-7313 Planning & Development, MHD 10 Park Plaza Boston, MA 02116
Metropolitan District Commission	MDC .....(617) 727-9693 20 Somerset St. Boston, MA 02108
Department of Environmental Management	DEM.....(617) 727-3160 Room 1404 100 Cambridge St. Boston, MA 02202
Metropolitan Area Planning Council	MAPC.....(617) 451-2770 60 Temple Place Boston, MA 02111
Central Transportation Planning Staff	CTPS.....(617) 973-7100 10 Park Plaza Boston, MA 02116

Organizations

Walk Boston	156 Milk St. .....(617) 451-1570 Boston, MA 02109
Bicycle Coalition of Massachusetts	BCOM.....(617) 491-7433 214A Broadway Cambridge, MA 02139
Rails to Trails Conservancy	RTC.....(202) 797-5400 1400 16th St. NW #300 Washington, DC 20036
Bicycle Federation/ Pedestrian Federation of America	BFA/PFA.....(202) 463-6622 1506 21st St. NW Suite 200 Washington, D.C. 20036

Local

In alphabetical order, by community. Addresses and phone numbers are same as Town or City Hall unless indicated otherwise.

Ashland, MA 01721

Town Hall	*101 Main St.*	*(508) 881-0100*
Board of Selectmen		
Executive Secretary		
Conservation Commission		
Department of Public Works	1 Ponderosa Rd.	(508) 881-0120
Parks/Recreation		(508) 881-0105
Planning Board		(508) 881-0115
Police Department	137 Main St.	(508) 881-1212

Dover, MA 02030

Town Hall	*5 Springdale Ave.*	*(508) 785-1719*
Board of Selectmen		(508) 785-2269
Executive Secretary		
Conservation Commission		(508) 785-1938
Highway Department	2 Dedham St.	(508) 785-0058
Engineer		
Parks/Recreation		(508) 785-0476
Planning Board		(508) 785-0032
Police Department	3 Walpole St.	(508) 785-1130

Framingham, MA 01701

Town Hall	*150 Concord Sq.*	*(508) 620-4800*
Board of Selectmen		(508) 620-4811
Town Administrator		(508) 620-4802
Conservation Commission		(508) 620-4844
Department of Public Works		(508) 620-4880
Engineer		(508) 620-4844
Parks/Recreation	475 Union Ave.	(508) 620-4834
Planning Board		(508) 620-4837
Police Department	81 Union Ave.	(508) 872-1212

Hudson, MA 01749

Town Hall	*78 Main St.*	*(508) 562-9963*
Board of Selectmen		
Executive Secretary		
Conservation Commission		(508) 568-8620
Department of Public Works	1 Municipal Dr.	(508) 562-9333
Parks/Recreation		(508) 562-9642
Planning Board		
Police Department	62 Packard St.	(508) 562-7122

Marlborough, MA 01752

City Hall	*140 Main St. City Hall*	*(508) 460-3700*
Mayor		(508) 460-3770
City Council		(508) 460-3771
Conservation Commission		(508) 460-3781
Department of Public Works	135 Neil St.	(508) 624-6910
Engineer	135 Neil St.	(508) 624-6913
Parks/Recreation	239 Concord Rd.	(508) 624-6925
Planning Board		(508) 460-3766
Police Department	355 Bolton St.	(508) 485-1212

Natick, MA 01760

Town Hall	*13 E. Central St.*	*(508) 651-7250*
Board of Selectmen		(508) 651-7230
Executive Secretary		(508) 651-7353
Conservation Commission		(508) 651-7263
Department of Public Works	75 West St.	(508) 651-7310
Engineer	75 West St.	(508) 651-7310
Parks/Recreation	179 Boden Ln.	(508) 651-7267
Planning Board		(508) 651-7260
Police Department	2 Park St.	(508) 651-7283

Needham, MA 02192

Town Hall	*1471 Highland Ave.*	*(617) 455-7500*
Board of Selectmen		(617) 455-7512
Executive Secretary		
Conservation Commission		(617) 455-7589

Needham, continued

Department of Public Works	470 Dedham Ave.	(617) 455-7534
Parks/Recreation		(617) 455-7521
Planning Board		(617) 455-7526
Police Department	88 Chestnut St.	(617) 455-7570

Sherborn, MA 01770

Town Hall	*19 Washington St.*	*(508) 651-7850*
Board of Selectmen		
Executive Secretary		
Conservation Commission		
Highway Department	11 Butler St.	(508) 651-7878
Engineer		
Parks/Recreation		
Planning Board		(508) 651-7855
Police Department		(508) 651-2424

Southborough, MA 01772

Town Hall	*17 Common St.*	*(508) 485-0710*
Board of Selectmen		
Executive Secretary		
Conservation Commission		
Highway Department	147 Corterville Rd.	(508) 485-1210
Parks/Recreation		
Planning Board		(508) 485-0717
Police Department	19 Main St.	(508) 485-2147

Sudbury, MA 01776

Town Hall	*278 Old Sudbury Rd.*	*(508) 443-8891*
Board of Selectmen		
Executive Secretary		
Conservation Commission		
Highway Department	275 Old Lancaster Rd.	(508) 443-2209
Engineer		
Parks/Recreation	40 Fairbanks Rd. .	(508) 443-8049
Planning Board		
Police Department	415 Boston Post Rd.	(508) 443-2121

Wayland, MA 01778	
Town Hall	*41 Cochituate Rd. .....(508) 358-7701*
Board of Selectmen	
Executive Secretary	
Conservation Commission	
Highway Department	195 Main St. .....(508) 653-4121
Engineer	
Parks/Recreation	
Planning Board	
Police Department	38 Cochituate Rd. .....(508) 358-7941
Wellesley, MA 02181	
Town Hall	*525 Washington St. .....(617) 431-1019*
Board of Selectmen	
Executive Secretary	
Conservation Commission	
Department of Public Works	455 Worcester St. .....(617) 235-7600
Engineer	
Parks/Recreation	79 Oak St. .....(617) 235-2370
Planning Board	
Police Department	485 Washington St. .....(617) 235-1212
Weston, MA 02193	
Town Hall	*P.O. Box 378 Town House Rd. ....(617) 893-7320*
Board of Selectmen	
Executive Secretary	
Conservation Commission	
Highway Department	190 Boston Post Rd. By Pass .....(617) 893-1263
Engineer	
Parks/Recreation	99 School St. .....(617) 899-9546
Planning Board	
Police Department	180 Boston Post Rd. .....(617) 893-4803